Customer Quality Newsletter

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Focusing on Intel's Process Control Systems

The Process Control System for Intel's manufacturing sites can be divided into three major areas: excursion prevention, control, and excursion management. Our primary focus is on excursion prevention, which includes the systems Intel uses to qualify suppliers and materials, processes for qualifying equipment involved in manufacturing, systems for certifying processes and packages, and systems for qualifying products.

Another focus area of considerable interest is process control. Intel's Process Control System is an on-line, real-time system for identifying and responding to process or equipment problems. Process control incorporates the traditional working elements of Statistical Process Control – measurement system, control charts, trend rules and response flow checklists. The third area, excursion management, is Intel's method for disposition of discrepant material.

Excursion Prevention

Materials used in the manufacturing process are under incoming materials control. The methodology for managing materials quality is embodied in Intel's Supplier Continuous Quality Improvement program. This program includes the development of a strong customer-supplier relationship for strategic materials, the use of distribution specifications and Cpk's (process capability indices), and the implementation of continuous process and system improvements.

Intel drives suppliers to implement the attributes of Intel's Process Control System to ensure the continuous quality of incoming materials. Intel defines materials requirements by technology and manufacturing needs. Measurement capability and correlation with the supplier are established. The next step is to determine the supplier process and product capability, and variables. Incoming production materials are monitored by statistical parameter distribution data, or through a Certificate of Compliance based on limit specifications.

Another excursion prevention focus area is the qualification of new manufacturing equipment. The manufacturer's specifications are validated and a manufacturability exercise is run. Equipment meeting the requirements for manufacturability is sent to a production area, which acts as a beta site. The equipment is disseminated to other manufacturing sites only after passing the beta site criteria. Monitors are then put into place to ensure the equipment variables are under control and performing as specified.

New Intel processes and packages must meet requirements for reliability and manufacturability. New processes or packages (and changes to existing processes or packages) are characterized at the critical processing steps for capability and for their ability to stay in statistical process control within the process module or assembly requirements. The critical process control parameters are determined before the process or package enters production, and are monitored continuously. Some important tools used to determine critical parameters to monitor are FMEA (Failure Mode Effects Analysis), and Intel's Risk Assessment Methodology.

Product performance is another critical aspect of the process or package certification. It is the finished product that must demonstrate required levels of reliability and manufacturability before full process or package certification is granted. To become qualified, new products must go through a series of quality and reliability checks during the following phases:

- Design
- Package and process development
- Manufacturing and test

These checks validate that the process, package,

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and product as a whole, is reliable and manufacturable.

Control

Statistical Process Control is one of the major methods for controlling fabrication and assembly processes. Intel identifies and controls key parameters to produce products that are reliable and of high quality. Intel strives to support our customers' quality, cost, functionality and time-to-market requirements with products and processes that are predictable and statistically accurate.

Each new process transfer and product transfer into manufacturing is closely monitored until process control, high volume, and yield targets are achieved. This process includes selection of significant process and product parameters for statistical control. Reaction plans and process control decision trees are developed to deal with process interruptions and out-of-statistical control situations. A system of daily, weekly, and monthly reviews ensures that any adverse trends, excursions, or deficiencies to goals are addressed. When key parameters fall outside specification limits, there are Response Flow Checklists in place to direct the appropriate actions.

Excursion Management

The possibility of discrepant materials always exists, but Intel's Material Disposition System endeavors to protect our customers' manufacturing lines from any negative impact. Intel's system provides a consistent methodology for the disposition of nonconforming products and materials. In the event discrepant material is identified, a Material Review Board is held for disposition purposes. This board determines, through formal risk assessments, whether reliability or manufacturing risks to Intel or our customers will result from using this material. Dispositions are documented, traceable, and auditable. In addition, any decisions to ship discrepant material based on positive findings from the risk assessment is formally approved by the factory and the business group in a Material Review Board forum. Corrective actions are formally tracked to closure.

Overall, Intel's infrastructure of an ISO 9000/9001:2000 compliant Quality System, and an organizational structure of cross-site engineering and management teams (which monitor and respond to the quality system and indicators), ensures delivery of quality products that are reliable and of high quality to our customers.

Breaking News

Intel to host Quality Road Show in Brazil on December 4, 2001

Intel's Customer Quality and Reliability group, in conjunction with Intel Brazil Sales and Marketing Office, will host the 2001 Brazil Quality Road Show on December 4, 2001, in Sao Paulo, Brazil.

The main objective of the event is to share Intel's Quality Operating System and Methodology with valued customers from the Brazilian region (OEMs, distributors, Channel customers, and end users). Attendance in excess of 350 people is anticipated. Topics to be presented include:

- Virtual Factory and Copy Exactly
- Quality Operating System
- Intel® Pentium® 4 processor Manufacturing
- Lead Free Initiative
- Process Control System
- Product Qualification Methodology

Feedback from Intel's Sales and Marketing Group indicates the event is receiving positive acceptance from the field, and will enhance Intel's customer relationship through the sharing of Intel's "Best

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Breaking News (continued)

Manufacturing Quality Practices." Please contact your local representative for more information.

Manufacturing Advantage Service

Electronic Design Kit New Release Enhances Customer Experience

Aided by flawless engineering support, the Electronic Design Kit versions 2.0 and 2.1 were launched successfully. Improvements such as content grouping, sorting content details, and change notification, enhance the customer experience.

Do You Know?

Protecting Intel's Customer: How managing and preventing issues can avert a crisis

"Bad companies are destroyed by crises; good companies survive them; and great companies are improved by them." Andy Grove, 1994

Whenever Intel discovers an issue, many cross-functional, multidisciplined teams of experts are involved, including groups such as Customer Quality and Reliability, manufacturing, product engineering, and the Issue Prevention and Management group. Intel's Issue Prevention and Management team helps internal product teams identify and manage issues that may potentially impact Intel's products and services. When issues, or potential issues are discovered, Issue Prevention & Management helps drive the process that addresses quality concerns, ensuring timely solutions are implemented.

The goal of the Issue Prevention and Management team is to protect Intel's customers and end users,

Do You Know? (continued)

as well as the Intel brand and image. Simply stated, the team focuses on helping product groups resolve errata and other types of issues that could impact our customers' ability to deploy and use Intel products. The tools and processes used to manage issues ensure that the customer is receiving quality product and reliable product from Intel, and the appropriate individuals immediately address both quality and reliability issues.

The Issue Prevention and Management organization was formed as a result of the FDIV (Floating point DIVision) consumer issue experienced by Intel in 1994. Also known as "the Pentium® processor floating point flaw," this issue made it apparent to Intel that consumers were identifying the Intel Inside® brand as the processor inside their personal computers. In the event of a product or service issue, Intel needed a fast and effective response method to ensure minimal customer impact.

Processes and tools developed by the Issue Prevention and Management team facilitate issue identification and communications for errata, quality and reliability, and perceived performance problems. Intel has global support teams and vendors worldwide, who stand ready to engage in the issue management process. This includes escalation planning, tracking and forecasting, call center support, and product fulfillment and refunds.

Ultimately, the Issue Prevention and Management team is endeavoring to enlighten the culture through increased training and awareness, by having every business identify and manage their issues, problems, and errata early on. In the first step, Issue Prevention and Management helps teams to build escalation plans, and train their employees to identify issues. This allows a faster response to potential issues. Next, the team trains groups to follow the Errata Communications process developed for timely disclosure of all errata discovered with Intel products. Third, the Issue Prevention and Management team participates on other problem resolution teams, in an effort to manage issues before they become a concern to our custom-

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Do You Know? (continued)

ers and end users.

Product issues can turn into crises, and be opportunities for success or failure if not managed quickly and effectively. Intel's Issue Prevention and Management team is committed to effectively managing and preventing issues that may otherwise impact our customers.

Policy Statement

All Intel businesses and subsidiaries
will be recognized as
#1, #2 or Excellent
for
Product and Service Quality
in the markets they serve.

Customer Feedback

An Opportunity to Share Your Thoughts

We value your readership and would like to hear from you. Please send your feedback to the Intel Customer Quality Newsletter e-mail address: customer.quality.newsletter@intel.com

Intel's Quality Principle

World-class Quality is an essential ingredient for Intel's success. In order to maintain our industry leadership, we are committed to making quality an integral part of every aspect of our business. As a diverse company serving numerous markets and customers, we will also continuously strive to deliver an outstanding quality image for all Intel and affiliated brands.

Quality Information Center

FACR:	1-800-628-8686 (in North America) or contact your local Customer Quality Engineer
Intel Developer:	developer.intel.com
Intel Quality System:	developer.intel.com/design/quality
Intel's OEM Customer:	oem.intel.com
Intel's Channel Support:	channel.intel.com
Contact your local Sales Representative for more information or visit our web site at:	support.intel.com
Feedback and Comments:	
Contact your local Field Sales Engineer or Customer Quality Engineer for more details.	
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